



US005761301A

## United States Patent [19]

Oshima et al.

[11] Patent Number: 5,761,301  
 [45] Date of Patent: Jun. 2, 1998

[54] MARK FORMING APPARATUS, METHOD OF FORMING LASER MARK ON OPTICAL DISK, REPRODUCING APPARATUS, OPTICAL DISK AND METHOD OF PRODUCING OPTICAL DISK

[75] Inventors: Mitsuaki Oshima, Kyoto; Yoshiro Gotoh, Osaka, both of Japan

[73] Assignee: Matsushita Electric Industrial Co., Ltd., Osaka, Japan

[21] Appl. No.: 560,015

[22] Filed: Nov. 17, 1995

## [30] Foreign Application Priority Data

Nov 17, 1994 [JP] Japan 6-283415  
 Feb 2, 1995 [JP] Japan 7-016153  
 Oct 9, 1995 [JP] Japan 7-261247

[51] Int. Cl.<sup>6</sup> H04K 1/00  
 [52] U.S. Cl. 380/4: 369/272; 235/494  
 [58] Field of Search 380/4: 369/272, 369/273, 286, 292, 52; 235/494

## [56] References Cited

## U.S. PATENT DOCUMENTS

5,065,429 11/1991 Lang 380/25  
 5,191,611 3/1993 Lang 380/25  
 5,392,351 2/1995 Hasebe et al. 380/4  
 5,400,403 3/1995 Fahn et al. 380/21  
 5,457,668 10/1995 Hibino et al. 380/4  
 5,457,746 10/1995 Dolphin 380/4  
 5,513,169 4/1996 Fite et al. 380/3

## FOREIGN PATENT DOCUMENTS

0545472	6/1993	European Pat. Off.	380/4
553545	8/1993	European Pat. Off.	
4308680	10/1993	Germany	
61-190734	8/1986	Japan	
63-46541	2/1988	Japan	
63-164043	7/1988	Japan	
2-44448	2/1990	Japan	
5-325193	1/1991	Japan	380/4
5-266576	10/1993	Japan	
7-325712	12/1995	Japan	
9101358	3/1993	Netherlands	

## OTHER PUBLICATIONS

European Search Report dated May 15, 1997.  
 International Search Report dated Jan. 30, 1996.

Primary Examiner—David C. Cain  
 Attorney, Agent, or Firm—Ratner & Prestia

## [57] ABSTRACT

An object of the present invention is to provide a marking forming apparatus, a method of forming a laser marking on an optical disk, a reproduction apparatus, an optical disk, and a method of manufacturing an optical disk, capable of providing a greatly improved copy prevention capability as compared to prior known construction. To achieve this object, in the optical disk of the invention, for example, a marking is formed by a laser on a reflective film of a disk holding data written thereon and at least position information of the marking or information concerning the position information is written on the disk in an encrypted form or with a digital signature appended thereto.

27 Claims, 43 Drawing Sheets

